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# **Poverty and Vulnerability - An Interdisciplinary Approach**

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# Poverty and Vulnerability: An Interdisciplinary Approach

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## **ABSTRACT**

This paper describes the concepts of poverty and vulnerability as well as the interconnections and differences between them using an interdisciplinary approach. While poverty is a static concept, vulnerability has a forward-looking dimension. We, therefore, review the methodologies that different disciplines use to measure poverty and vulnerability. In particular, the differences between vulnerability to natural disasters, vulnerability to climate change, as well as vulnerability to poverty are highlighted to reflect how vulnerability is perceived in natural sciences as well as in economics. The three case studies from Tajikistan, Malawi, and Europe show how the different dimensions of vulnerability impact on household welfare and livelihoods in developing as well as developed countries.

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## **1. INTRODUCTION**

The world has experienced dramatic environmental and socioeconomic changes in recent decades. Phenomena like population growth, rapid urbanisation processes, increasing poverty but also environmental degradation, climate change, and the increase in natural disasters have affected the social and economic development in many parts of the world. Because of these different factors, which can be summarised under the term “global change”, many people have become more vulnerable to the negative effects of very different hazards. Thus the concept of vulnerability has become more and more prominent in recent decades.

Poverty as the other important aspect of this paper is prevalent in large parts of the world and is one of the largest challenges of mankind in the 21<sup>st</sup> century. Therefore the member states of the United Nations decided at the Millennium Summit in 2000 to combat global poverty and to halve the number of poor people by the year 2015. The Millennium Development Goals (MDGs) name quantitative targets and indicators in order to measure progress in the fight against poverty. The achievement of these targets is jeopardised by global change, because poor people mostly have the least possibilities to cope with its negative effects. Therefore it is important to analyse their vulnerability to different risks, and subsequently to enhance their abilities to cope with these effects.

Poverty cannot be reduced to income poverty, but there are other important factors, which determine the well-being of people. As vulnerability is also a multi-dimensional approach, the application of such a comprehensive view might give the chance to get a holistic picture of chances and threats for the livelihoods of people particularly in developing countries.

One objective of this paper is to give an introduction to the meaning of the terms poverty and vulnerability, and to present an overview about different concepts. This will be done in the chapters 2 and 3. Chapter 4 can be seen as the core of the paper, as it shows the interconnections but also the differences between the two concepts. Chapter 5 analyses approaches to measure poverty and vulnerability, which is still quite a challenge because of their multi-dimensional nature. Nevertheless there are also approaches, which are restricted to the measuring of income poverty. Chapter 6 gives a brief overview about vulnerable groups with a focus on vulnerability to poverty. Before we finally draw the conclusions from our analyses in chapter 8, chapter 7 contains three case studies from Malawi, Tajikistan and Europe. Two of these case studies deal with the vulnerability to natural hazards, while the Tajikistan example discusses vulnerability to poverty. These examples from developing as well as from developed countries shall serve as an application to the more theoretical and conceptual approach of the former chapters.

## **2. DEFINITION OF POVERTY**

The notion of poverty is determined in different ways by different institutions. The indicators of poverty differ as well. For ease of reference and coherence in global assessments, development agencies often employ quantitative measures of poverty, such as those setting a threshold of one or two dollars a day. Specific indicators relating to certain economic and social factors (such as infant mortality and literacy rates) are also employed. But many aspects of poverty, some of which are crucial to a human rights analysis, are not reflected in the statistical indicators. However, poverty has a number of definitions that have different measuring dimensions.

UNHCR defines "Poverty" as a human condition characterized by the sustained or chronic deprivation of the resources, capabilities, choices, security and power necessary for the enjoyment of an adequate standard of living and other civil, cultural, economic, political social rights (UNHCR 2004). Thus, poverty is the state of being without the necessities of daily living, often associated with need, hardship and lack of resources across a wide range of circumstances. For some, poverty is a subjective and comparative term; for others, it is moral and evaluative; and for others, scientifically established.

The Copenhagen Declaration of 1995, describes absolute poverty as "a condition characterised by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information." The World Bank, on the other hand identifies "extreme poverty" as being people who live on less than US \$1 a day, and "poverty" as less than \$2 a day. On that standard, 21% of the world's population was in extreme poverty, and more than half the world's population were poor in 2001.

According to the World Bank (2001), about 1.1 billion humans worldwide (which is 21% of the world population) had less than \$1 in local purchasing power per day. (In comparison: 1981 there were 1.5 billion humans, which made up 40% of the world population; in 1987, 1.227 billion humans equaling 30%; in 1993, 1.314 billion humans equaling 29% of the world population).

Poverty may be seen as the collective condition of poor people, or of poor groups, and in this sense entire nation-states are sometimes regarded as poor. To avoid stigma these are usually called developing nations, instead of calling them impoverished nations.

However, economic deprivation – lack of income – is a standard feature of most definitions of poverty. But this in itself does not take account of the myriad of social, cultural and political aspects of the phenomenon. Poverty is not only deprivation of economic or material resources but a violation of human dignity too. In this regard it worth to note the phrase by Kofi Annan, UN Secretary General that states: "Wherever we lift one soul out of a life of poverty, we are

defending human rights. And whenever we fail in this mission, we are failing human rights” (UNHCR 2004).

Poverty can be conceived as absolute or relative, as lack of income or failure to attain capabilities. It can be chronic or temporary, it is sometimes closely associated with inequity, and is often correlated with vulnerabilities and social exclusion. Chapter 5 of this paper reviews the main types and families of indicators that have emerged over time, highlighting their strengths and weaknesses.

As far as the poverty issue is discussed, it is always closely associated with the poverty line. The poverty line is the minimum threshold level of income (or consumption) below which one cannot afford to purchase all the resources one requires to live. People who have an income below the poverty line have no discretionary disposable income, by definition (CCSD 2001).

Practically, different countries often use different poverty lines. But in general, it is more common to use only one poverty line in order to compare economic welfare levels of countries and regions. When comparing poverty across countries, the purchasing power parity exchange rates are used. These are used to ensure that the poverty levels do not change with the normal exchange rates. Thus, as it was already mentioned, 'living for under \$1 a day' should be understood as having a daily total consumption of goods and services comparable to the amount of goods and services that can be bought in the US for \$1. Self-produced goods and public services are included in this measure.

Poverty is not an exceptional case. Almost all societies have some of their citizens living in poverty. The poverty line is useful as an economic tool with which to measure such people and consider socioeconomic reforms such as welfare and unemployment insurance to reduce poverty. Determining the poverty line is usually done by finding the total cost of all the essential resources that an average human adult consumes in one year. This approach is needs-based in that an assessment is made of the minimum expenditure needed to maintain a tolerable life (Sawhil 1990).

## **2.1 Main Concepts of Poverty**

As a multidimensional phenomenon, poverty is defined and measured in a multitude of ways. This section describes different concepts of poverty and attempt to distinguish them from and other closely related concepts.

From the perspective of indicators, these distinctions are important since poverty measurement and subsequent policy and programme implications depend on what facets or angles of poverty are being addressed. For example, if a national poverty reduction strategy is supposed to address both temporary and chronic poverty, two distinct sets of policies and programmes would be required, along with two sets of indicators for establishing baselines and monitoring progress (Dessalien 2000). Likewise, if the definition of poverty is based on the human capabilities concept, then appropriate sets of indicators would be required to

measure it along with corresponding policies and programmes to address it. This would result in poverty reduction strategies that differ from those associated with an income-based concept of poverty (UNDP Poverty Report 2000).

## **2.2 Absolute and Relative Poverty**

Poverty can be viewed in absolute and relative terms. Absolute poverty refers to subsistence below minimum, socially acceptable living conditions, usually established based on nutritional requirements and other essential goods. Relative poverty compares the lowest segments of a population with upper segments, usually measured in income quintiles or deciles. Absolute and relative poverty trends may move in opposite directions. For example, relative poverty may decline while absolute poverty increases if the gap between upper and lower strata of a population is reduced by a decline in well being of the former at the same time that additional households fall beneath the absolute poverty line (Dessalien 2000).

Even within so-called absolute poverty, countries often distinguish between indigence, or primary poverty and secondary poverty (sometimes referred to as extreme and overall poverty). Indigence usually refers to those who do not have access to the basic necessities for human survival, while other forms of poverty refer to degrees of deprivation above that threshold. For example, households incapable of obtaining sufficient food for survival are considered absolutely poor. However, the costs and composition of that food basket may vary considerably between households across different groups, regions and countries.

Another facet of absolute and relative aspects of poverty pertains to changes in circumstances. For example, if prices rise faster than incomes, the well-being of some households classified as relatively poor may decline to levels formally associated with absolute poverty, without a corresponding change in status since the living standards of the absolute poor have also declined proportionally. A similar situation arises when cultural or status values change over time.

## **2.3 Perspectives of Poverty**

Poverty can be approached from objective or subjective perspectives. The objective perspective (sometimes referred to as the welfare approach) involves normative judgements as to what constitutes poverty and what is required to move people out of their impoverished state. The subjective approach, on the other hand, places a premium on people's preferences, on how much they value goods and services (hence the emphasis on individual utility). Economists have traditionally based their work on the objective approach, mainly because of the obstacles encountered when trying to aggregate multiple individual utilities across a population (Dessalien 2000). Advocates of this approach use the argument that individuals are not always the best judge of what is best for them. For example, most poverty measurement systems focus on nutritional attainments. The main argument under this focus although all individuals value food consumption, some may place higher value on certain food types or food quantities that are not best for their physiological well being. It is conceivable



that the subjective approach could both undervalue and overvalue food consumption when compared to the welfare approach, leading to conflicting assessments as to who are the poor.

However, poverty measurement has traditionally been dominated by the objective approach. Only relatively recently has the international community as a whole taken a serious interest in measuring subjective poverty. This is mainly because of mounting recognition of the limitations associated with so-called objective indicators and the value of understanding the perspectives of the poor in shaping policies and programmes. As a result, participatory poverty assessment methodologies have been gaining ground (Dessalien 2000).

Clearly both objective and subjective perspectives bring valuable insights to the measurement and analysis of poverty. They approach the phenomena from different angles and capture fundamentally different aspects of it, neither of which can be said to be categorically right or wrong.

## **2.4 Poverty Indicators**

### **2.4.1 Quantitative and Qualitative**

Quantitative and qualitative indicators are sometimes confused with objective and subjective perspectives of poverty. In fact, an objective concept of poverty could be measured with both quantitative and qualitative indicators, and the same applies to subjective approaches. For example, an objective approach to poverty measurement may determine that perceptions of deteriorating academic standards (a qualitative indicator) are the principal cause of declining school enrolment. Likewise, a subjective approach to poverty measurement may reveal that household composition (which can be quantified) is a central characteristic of poverty.

The confusion arises because the main methodologies for obtaining “objective” poverty indicators are survey questionnaires, which generally place a premium on quantitative data. Conversely, the main instruments used to ascertain subjective perspectives of poverty result in generous amounts of qualitative information (although they may also generate quantitative data). Quantitative data can be aggregated whereas qualitative information usually cannot. On the other hand, qualitative information may provide a subtler picture of reality than can quantitative data (Dessalien 2000).

## **3. DEFINITION AND CONCEPTS OF VULNERABILITY**

The world has experienced dramatic environmental and socioeconomic changes in recent decades. Phenomena like population growth, rapid urbanisation processes, poverty but also environmental degradation, climate change, and the increase in natural disasters have affected the social and economic development in many parts of the world. Because of these

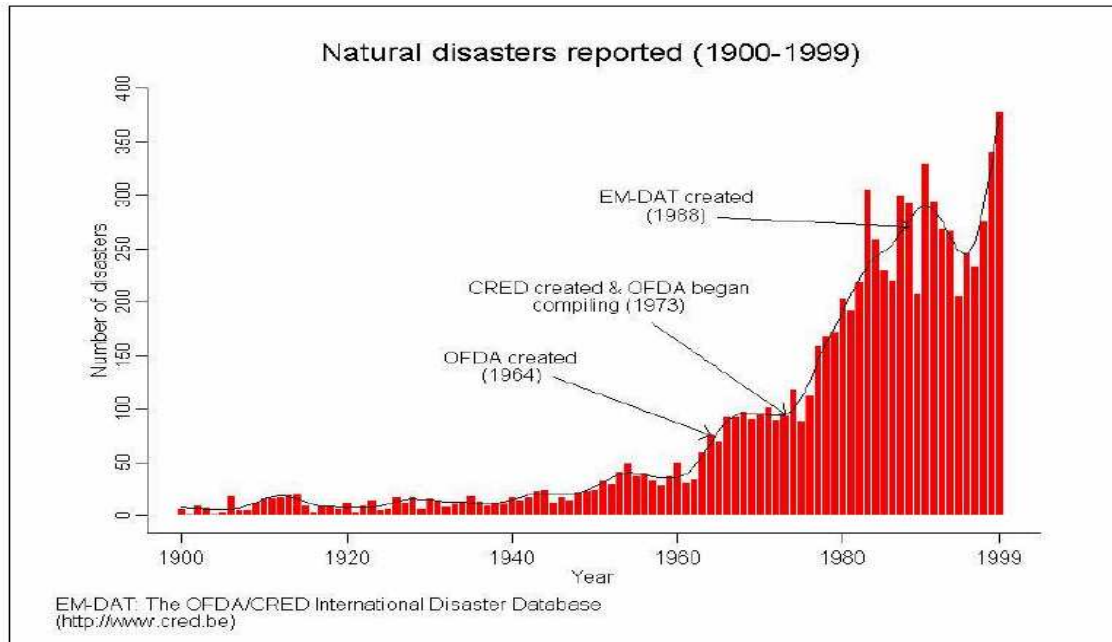
different aspects of global change many people have become more vulnerable to the negative effects of very different hazards. Hazard in this context means:

“A property or situation that under particular circumstances could lead to harm. More specific, a hazard is a potentially damaging physical event, phenomenon or human activity, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Hazards can be single, sequential or combined in their origin and effects. Each hazard is characterised by its location, intensity and probability” (UN/ISDR 2004a).

This broad definition shows the multi-faceted nature of the term, i.e. vulnerability can be related to a lot of different hazards. Households, communities, countries etc. can be vulnerable to any kind of event that may have harmful consequences for them once it takes place. This is one reason, why it is pretty difficult to describe or to even measure vulnerability. It is only really displayed when an event takes place. One year ago probably no one in Sri Lanka had the idea that establishing critical infrastructure like hospitals or schools directly at the coastline might be quite dangerous. Now, after the tsunami had struck the island in December 2004 and caused a huge number of fatalities, we know about that particular risk, and vulnerability assessments are now taking place (Birkmann, personal communication).

Despite this broad approach most studies on this topic deal with the vulnerability to natural hazards, to climate change or to poverty. This particular aspect, the general vulnerability to become poor or to stay poor, shall be dealt with in more detail in chapter 4, which analyses the linkages between vulnerability and poverty. The vulnerability to the impacts of climate change is gaining more and more importance, as it is getting clearer, that mankind cannot avoid some negative impacts of climate change, regardless of the next steps taken to reduce global greenhouse gas emissions (IPCC 2001).

The frequency and magnitude of natural disasters have increased in recent decades, as it can be seen in figure 1. This encompasses e.g. hazards like floods, droughts, earthquakes, volcanic eruptions, or storm surges. Some of these natural events are triggered by anthropogenic activities, like land degradation or the combustion of fossil fuels. Global environmental change and especially the anthropogenic interference of the earth's climate system lead to the warming of the atmosphere, which will in turn have a severe impact on the frequency and magnitude of some natural disasters.



**Figure 1: Number of Natural Disasters Reported, 1900-1999. (Source: Feldbrügge and von Braun 2002: 21)**

These increases in natural disasters as well as the other impacts of global change have led the international community to concentrating more on mitigating the impacts of such hazards. By dealing with this topic a paradigm shift (Birkmann, forthcoming 2006; Thywissen, forthcoming 2006) has taken place: while the traditional view focused on the hazard itself and on technical aspects in order to minimise its impacts, in recent decades scientists as well as practitioners switched more and more towards the livelihood of the affected people or communities in order to reduce their susceptibility to such events. Schneiderbauer and Ehrlich state: "The term 'vulnerability' was introduced as a response to the hazard-centric perception of disasters in the 1970s (...). With its growing recognition at the beginning of the 1980s, 'vulnerability' was used to express the understanding that the extent to which people suffer from calamities depends on (a) 'the likelihood of being exposed to hazards' and (b) 'their capacity to withstand them, which relates to their socio-economic circumstances'" (Schneiderbauer and Ehrlich 2004: 13). By applying this preventive approach the concept of vulnerability has gained more prominence in recent decades.

This focus on the vulnerability of potentially affected people is i.e. due to the fact, that a natural hazard is not a disaster by itself, but it only becomes a disaster with potentially severe consequences through the presence of people, who are vulnerable to its impacts. (Prowse 2003: 4) This has also been stressed by Kofi Annan: "Natural hazards are a part of life. But hazards only become disasters when people's lives and livelihoods are swept away." (Annan 2003).

As many people and disciplines are working on vulnerability, the meaning of the term as well as its influencing factors have become more and more confusing (Thywissen calls it

“Babelonian confusion”; Thywissen, forthcoming 2006): “although practitioners, experts and researchers agreed on the need to further emphasise the socio-economic situation, their view on the concept of vulnerability and the underlying definitions diverged strongly depending on the approach adopted” (Schneiderbauer, Ehrlich 2004: 14).

There are myriads of different definitions for the term vulnerability. It would go far beyond the scope of this paper to list and discuss them all. Extensive work on this topic has been done by Thywissen (forthcoming 2006). Differences in definitions arise from the discipline that looks at vulnerability. A person working in development cooperation will certainly put a different focus than a disaster manager, an economist or a construction engineer.

Two general definitions that are well-known and that can be regarded as being quite comprehensive, shall be stated here as examples. The International Strategy for Disaster Reduction (UN/ISDR) sees vulnerability as

*“The conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards.”*

(UN/ISDR 2004)

The United Nations Development Programme in contrast defines vulnerability as:

*“A human condition or process resulting from physical, social, economic and environmental factors, which determine the likelihood and scale of damage from the impact of a given hazard.”*

(UNDP 2004a)

Both definitions – like many of the other definitions – put an emphasis on the human conditions as a major factor of vulnerability. Therefore UNDP also developed the human-centred Disaster Risk Index, which measures the vulnerability of a community by dividing the number of people killed by the number of people exposed (Birkmann 2005: 2).

Thus vulnerability generally describes the internal risk of being affected by such a harmful event (Cardona 2004: 37). For some authors vulnerability also comprises the ability to cope with such events and to recover after them (Birkmann forthcoming 2006).

Determination of vulnerability must always be hazard-specific (Adger 1998: 9), i.e. one must always ask: vulnerability to what? (Cardona 2004: 38). A coastal community in a developing country might be highly vulnerable to floods, but not at all to droughts.

Furthermore the level has to be taken into account, whose vulnerability shall be assessed, as it makes a big difference for the choice of vulnerability indicators, if vulnerability shall be evaluated for a single household or for a whole country. Adger (1998: 6) e.g. differentiates between individual (household) and collective vulnerability.

Apart from the many different approaches, all authors agree that vulnerability is a multi-dimensional concept that comprises physical, social, economic, environmental, political, cultural and institutional factors. This multi-dimensionality and the focus on non-natural science issues make vulnerability more difficult to measure or just allow a qualitative approach for measuring (Thywissen, forthcoming 2006).

German Technical Cooperation (GTZ) states that “vulnerability is caused by a broad range of political, institutional, economic, environmental and socio-cultural factors such as insufficient knowledge, organisational gaps, lack of personal and financial resource, inadequate legislation, etc.” (GTZ 2005: 13). Thus vulnerability must not be restricted to a simple cause-effect relationship (GTZ 2005: 15).

Also many authors emphasise the dynamic and forward-looking nature of the vulnerability approach (Heitzmann et al. 2002: 1). It is regarded as being dynamic, because the vulnerability of a community or any other element at risk is never a determined factor, but it can change over time, and enhancing the coping capacity of the element at risk can certainly influence its vulnerability (Alwang et al. 2001: 25; GTZ 2005: 13).

Vulnerability does – in contrast to poverty – not only describe a current status of a society, but it contains a predictive feature, i.e. it describes what might happen in the future, if a certain hazard is going to occur. Cannon et al. emphasise its forward-looking nature: “vulnerability should involve a predictive quality: it is supposedly a way of conceptualizing what may happen to an identifiable population under conditions of particular risk and hazards.” (Cannon et al. 2003: 4). Vulnerability is “an intrinsic characteristic of a community” (Thywissen, forthcoming 2006), which is always there and which is only revealed, when a hazard takes place.

### **3.1 Different Concepts of Vulnerability**

This part is intended to give a brief overview on different approaches to analyze vulnerability. Again it is beyond the scope of this paper to give a comprehensive analyse about all approaches, as a lot of different ideas have evolved in recent years.

Bohle distinguishes between the “internal” and the “external” side of vulnerability. The external side refers to the structural dimensions of vulnerability and risk, and describes the exposure of the affected people, while the internal side marks the actions of the people to cope with hazards or at least mitigate their negative effects. These coping mechanisms are a highly complex issue, and have so far been neglected in theoretical and conceptual discussions (Bohle 2001).

In his approach to the social and economic vulnerability to climate change in Vietnam, Adger goes into a similar direction, when he describes vulnerability as “a combination of social factors and environmental risk, where risks are those physical aspects of climate related hazards exogenous to the social system” (Adger 1998: 5)

In their report for DFID Cannon et al. concentrate on social vulnerability, which is “much more than the likelihood of buildings to collapse or infrastructure to be damaged” (Cannon et al. 2003: 5). It is a “complex set of characteristics that include a person’s

- initial well being (nutritional status, physical and mental health, morale);
- livelihood and resilience (asset pattern and capitals, income and exchange options, qualifications);
- self-protection (the degree of protection afforded by capability and willingness to build safe home, use safe site);
- social protection (forms of hazard preparedness provided by society more generally, e.g. building codes, mitigation measures, shelters, preparedness);
- social and political networks and institutions (social capital, but also role of institutional environment in setting good conditions for hazard precautions, peoples’ rights to express needs and of access to preparedness)” (Cannon et al. 2003: 5).

This listing again points out the complex, multi-dimensional nature of the vulnerability concept.

Downing et al. (forthcoming 2006: 4) also focus on social vulnerability. They worked out six attributes, which are in parts like a summary of the previous chapter. According to them vulnerability is:

- the differential exposure to stresses experienced or anticipated by different units exposed,
- a dynamic process,
- rooted in the actions and multiple attributes of human actors,
- is often determined by social networks in social, economic, political and environmental interactions,
- manifested simultaneously on more than one scale,
- influenced and driven by multiple stresses.

Cardona (2004: 48) analyses the linkages between vulnerability and development. He points out that “vulnerability signifies a lack or a deficit of development” and that “risk is constructed socially”. Therefore he also focuses on the intrinsic susceptibility of a community. In his opinion vulnerability originates in: physical fragility or exposure, socio-economic fragility, and a lack of resilience (Cardona 2004: 49). By taking a look at these parameters he tries to get to a holistic view of vulnerability, which covers both physical factors as well as socio-economic aspects.

The Pressure and Release Model (PAR) by Wisner et al. (2004: 49ff.) distinguishes between the processes generating vulnerability and the natural hazard. This model, which is based upon the often used equation,  $Risk = Hazard \times Vulnerability$ , defines three different levels of vulnerability: the “root causes” describe economic, demographic and political processes that determine the access to power and resources, while the category “dynamic pressure” comprises processes, which channel the effects of the first category into unsafe conditions, like epidemics, rapid urbanisation and violent conflicts. The unsafe conditions form the third

category, reveals human vulnerability. For example made up of protection against diseases, or living in hazardous locations.

Birkmann (forthcoming 2006) draws the conclusion that nearly all concepts concentrate more and more on the “internal side of risk”. That means that the focus switches from the hazard itself and technical and engineering solutions to the society at risk and its possibilities to deal with the negative effect of hazards.

Finally Figure 2 shows the “onion framework”, an example of a comprehensive model to analyse the different spheres of vulnerability and the abilities of a community to cope with the effects of a hazard, which in this case is a flood (Bogardi and Birkmann 2004; Birkmann, forthcoming 2006). The circle relating to the social sphere contains different capacities of a society to cope with a hazard. Thus this model also states that “whether a flood event becomes a disaster or not depends almost as much on the preparedness and coping capacity of the affected society as on the nature of the flood event itself” (Birkmann, forthcoming 2006).

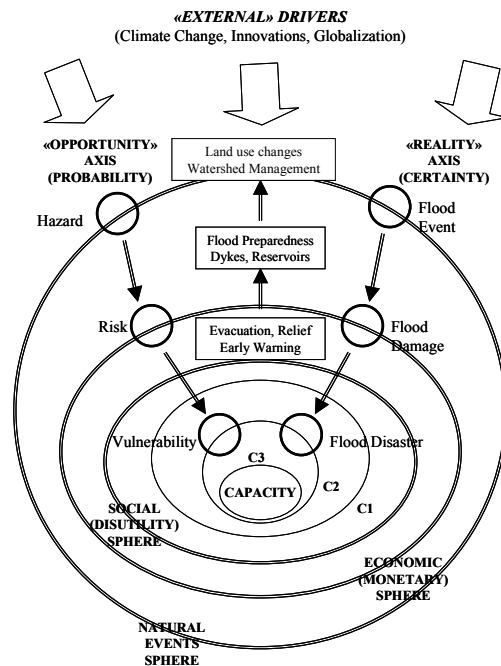


Figure 2: Model of the social response to floods. (Source: Bogardi and Birkmann 2004: 79).

#### **4. LINKAGES BETWEEN VULNERABILITY AND POVERTY**

Most authors working on vulnerability see a clear linkage between vulnerability and poverty, regardless of the hazard they are looking at. They also emphasise that vulnerability and poverty are not describing the same aspect, but that there are clear differences (e.g. Hoogeveen et al. 2004: 5).

The vulnerability to poverty, i.e. to fall below the poverty line, forms a particular linkage between the two concepts. It will be described at the end of this chapter.

The previous two chapters have shown that today vulnerability and poverty are both seen as multi-dimensional concepts. Poverty is not only regarded as not having enough income anymore, but also looks at the “well-being” of the people, while vulnerability focuses more on social and economic obstacles than on the hazard itself.

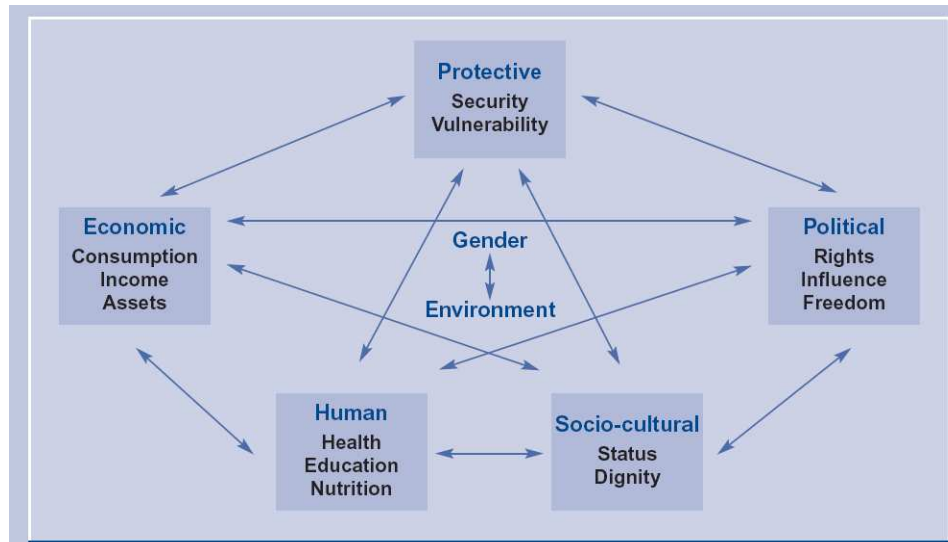
The most striking difference is the dynamic nature of vulnerability, as it has been outlined in the previous chapter. It gives a forward-looking perspective on what might happen, if a certain hazard takes place. Poverty in contrast is a description and measure of current status. This view has been taken e.g. by Alwang et al. (2001) and Cannon et al. (2003).

Furthermore poverty is not hazard-specific like vulnerability, as it has been pointed out by Adger: “Poverty may or may not be a relative term, but there are not varying “poverties” for any one individual or family” (Adger 1998: 9).

The linkages between vulnerability and poverty have been the subject of intensive research and discussion. Depending on the discipline and on the objectives of the study vulnerability is often seen as being a component of poverty or vice versa. As vulnerability is a pretty new concept – especially in comparison to poverty – some authors, particularly those working in the context of development cooperation, see vulnerability as one aspect, which can cause poverty or hinder people from escaping out of poverty. Prowse e.g. mentions a few studies, which describe vulnerability “as being part of the multiple dimensions of poverty” (Prowse 2003: 9). The inclusion of vulnerability into analyses of poverty is supported by the fact that today poverty is not only being measured as income poverty, but seen within a larger framework of “well-being”, which tries to take a comprehensive view on the livelihood of the people.

Figure 3 illustrates an example for the view of the development cooperation community towards the relation between vulnerability and poverty. Here vulnerability is one of several factors determining poverty.





**Figure 3: Dimensions of Poverty (GTZ 2005)**

Researchers from the vulnerability community in contrast tend to view poverty as one element, which may contribute to an enhanced vulnerability. Thus Adger utilizes (income) poverty as an indicator for analysing vulnerability to climate change and to climate extremes, because poverty correlates with a limited access to resources (Adger 1998: 7). Vogel also emphasises the importance of access to assets (Vogel 2001: 3), while Cardona states: “One example is the case of poverty, which may well be considered a factor or contributing cause of vulnerability but is certainly not vulnerability in itself.” (Cardona 2004: 48). He concludes that the provision of basic needs is an important step towards a reduction of vulnerability.

The majority of works on the linkages between vulnerability and poverty expresses the view that these two approaches are closely connected and influence each other very deeply, while they are at the same time clearly distinct from each other. Particularly German Technical Cooperation (GTZ) points out that “vulnerability can be seen as a cause of poverty, as a reason why the poor remain poor, or as an effect of poverty” (GTZ 2005: 15). Prowse points in the same direction, when he talks about the “mutually-reinforcing nature of poverty and vulnerability” (Prowse 2003: 8).

The paradigm shift concerning vulnerability with a much stronger focus on the livelihood of the people than on the hazard itself implies the necessity to analyse the interconnections between these two concepts, as poverty weakens the livelihood of poor people on many levels: they often live in particularly exposed areas, have less assets to protect themselves, have weak governmental institutions, suffer from a lower health and educational standard, and have less capacities to cope with a disaster once it takes place (Cannon et al. 2003; Heitzmann et al. 2002; Adger 1998). Cardona summarizes these factors, which determine vulnerability under the aspects physical fragility or exposure, socio-economic fragility, and lack of resilience (Cardona 2004: 49).

Thus there is a tenor that poor people are generally more vulnerable, regardless of the hazard, although this is by no means a mandatory interconnection (Adger 1998; Wisner et al.

2004; Heitzmann et al. 2002; Cannon et al. 2003; Feldbrügge and von Braun 2002). The United States as a very wealthy country and the state Louisiana in particular were severely affected by the impacts of the hurricanes Rita, Wilma, and Katrina, which hit the east coast of the United States between August and October 2005. They caused more than 1.000 fatalities and economic losses of several hundred billion US\$. The hurricanes affected all parts of the population, although there are also reports saying that poorer people (e.g. people without cars or black people) were disadvantaged in contrast to wealthier people.

Some authors deal with the special case of vulnerability to fall below the poverty line or to stay there for a longer period (Alwang et al. 2001; Chaudhuri et al. 2002; Prowse 2003). A definition of vulnerability to poverty is given by Chaudhuri et al.: “We define vulnerability, within the framework of poverty eradication, as the ex-ante risk that a household will, if currently non-poor, fall below the poverty line, or if currently poor, will remain in poverty.” (Chaudhuri et al. 2002: 4). These approaches are mostly restricted to income vulnerability and they try to find a common metric for all indicators. Thus they are mostly restricted to money-metric approaches and tend to disregard other indicators that are more difficult to be translated into monetary terms (Alwang et al. 2001: 6; see also Kamanou and Morduch 2002). Chaudhuri et al. (2002: 6) give an example of this narrowed focus: “To estimate a household’s vulnerability to poverty we need therefore to, at a minimum, estimate both its expected consumption and the variance of its consumption.” Chapter 5.2 of this paper will give a more detailed view on attempts to measure vulnerability to poverty by using an economic approach. Generally the introduction of the vulnerability concept into poverty literature shows the recognition of the dynamic nature of poverty, in a way that vulnerability “as an ex ante and forward looking probabilistic measure” (Alwang et al. 2001: 8) gives information on the probability to fall below the poverty line. This introduction of the time reference of poverty is also expressed by the definition by Chaudhuri et al. given above.

## **5. POVERTY AND VULNERABILITY MEASURES**

This section outlines the most frequently used measurements of poverty and vulnerability. It should be pointed out that the discussion is not conclusive as there are other measures, particularly for measuring vulnerability that are still being developed, that are therefore not outlined in the chapter.

### **5.1 Poverty Measures**

There are several methods that are used to measure poverty. We briefly present some of the measures in this section and also highlight the advantages and disadvantages of each measure.

### 5.1.1. Poverty Incidence or Poverty Rate, $P_0$

A **Poverty Incidence** or a **Poverty Rate**, usually denoted as  $P_0$ , is the share of the population whose consumption (or income) is below the poverty line. This measure quantifies the share of the population that cannot afford to buy a basket of goods. When the unit of analysis is an individual, the poverty rate is also called a **Poverty Headcount Index** since it is the ratio of the number of poor people to the total population.

Mathematically, the poverty rate  $P_0$  is given as:

$$P_0 = \frac{1}{N} \sum_{i=1}^N I(y_i < z) = \frac{1}{N} \sum_{i=1}^q 1 = \frac{N_p}{N}, \dots\dots\dots(1)$$

Where:  $N$  = total population  
 $I(.)$  = an indicator function taking a value of  
 1 (poor) if the bracketed expression is true, and 0 (nonpoor)  
 otherwise.  
 $y_i$  = welfare indicator, e.g., consumption per capita  
 $z$  = poverty line  
 $N_p$  = number of poor in the population

Besides being simple to construct, the Poverty Rate measure has an advantage of being easy to understand. It also has an advantage of being an adequate measure of assessing the overall progress in reducing poverty. However, the poverty rate suffers from major limitations. First, it ignores differences in well-being between different poor households by assuming that the poor are all in the same situation. Second, the index is not sensitive to changes in the welfare of individuals as long as they remain below the poverty line. The third limitation is that the index does not take the intensity of poverty into account.

### 5.1.2. Poverty Gap Index, $P_1$

The second measure of poverty is the Poverty Gap Index,  $P_1$ . It is the average, over all people, of the proportionate gaps between poor people's living standards and the poverty line (as a proportion of the poverty line). It is also called the Depth of Poverty Index.

Mathematically the Poverty Gap Index is defined as:

$$P_1 = \frac{1}{N} \sum_{i=1}^N \left( \frac{z - y_i}{z} \right) I(z - y_i) = \frac{1}{N} \sum_{i=1}^q \left( \frac{z - y_i}{z} \right) \dots\dots\dots(2)$$

where the variables are defined as in equation 1.

The *poverty gap index* measures the degree to which the mean income of the poor differs from the established poverty line (depth of poverty). The advantage of this measure is that it reflects the average shortfall of poor people, thereby giving a better understanding of the

depth of poverty. Another advantage of the  $P_1$  measure is that it shows how much would have to be transferred to the poor to bring their expenditure up to the poverty line. It is therefore easy to derive from the index, the *minimum* cost for eliminating poverty with transfers (i.e. the cost to eliminate poverty with perfect targeting of the poor and with no targeting costs or distortion costs). However, the major limitation of the  $P_1$  index does not capture differences in the severity of poverty among the poor and it ignores inequality among the poor themselves.

### 5.1.3. The Squared Poverty Gap Index, $P_2$

The third measure of poverty is the Squared Poverty Gap Index,  $P_2$ . It is the average of the square relative poverty gaps.  $P_2$  is defined similar to the Poverty Gap Index except that the poverty gaps are squared, thus giving the highest weighting to the largest poverty gaps. The *squared poverty gap index*, capture differences in income levels among the poor. This measure is also called the **Severity of Poverty Index**.

Taking our previous notations,  $P_2$  can be defined as:

$$P_2 = \frac{1}{N} \sum_{i=1}^q \left( \frac{z - y_i}{z} \right)^2 \dots\dots\dots(3)$$

The advantage of  $P_2$  is that it takes into account not only the distance separating the poor from the poverty line (i.e. the poverty gap), but also the inequality among the poor. In particular, the need for  $P_2$  arises because  $P_1$  may not adequately capture the distributional changes within the poor segment of the population. For example, if a policy is put in place which has an effect of transferring cash from an individual just below the poverty line to the poorest person, the Squared Poverty Gap Index would be able to reflect this change, which the Poverty Gap Index would not.

The major limitation of  $P_2$  is its lack for intuitive appeal because it is not easy to interpret it and so it is not widely used.

### 5.1.4. The Foster-Greer-Thorbecke Poverty Index

The Headcount Index, the Poverty Gap Index, and the Squared poverty Gap Index belong to a family of poverty measures known as the Foster-Greer-Thorbecke (FGT) Index. These are referred to as *decomposable* poverty measures. A poverty measure is said to be *decomposable* if the poverty measure of a group is a weighted average of the poverty measures of the individuals in a group (Aguirregabiria, 2003).

The general formula for the FGT class of poverty measures is:

$$P_\alpha = \frac{1}{N} \sum_{i=1}^q \left( \frac{z - y_i}{z} \right)^\alpha \dots\dots\dots(4)$$

where  $\alpha \geq 0$

The parameter  $\alpha$  reflects poverty aversion. Larger values of  $\alpha$  put higher weight on the poverty gaps of the poorest people. By setting  $\alpha=0$ , equation 4 reduces to a Head Count Index ( $P_0$ ). If  $\alpha=1$ , the equation 4 becomes a Poverty Gap Index, aggregating the proportionate poverty gap, which shows the shortfall of the poors' income from the poverty line, expressed as an average over the whole population.

#### 5.1.5. The Human Poverty Index

While the measures of poverty that have been discussed in this section use income in the calculations, the Human Poverty Index (HPI) is a non-income measure of poverty. The Human Poverty Index is a measure of poverty that is increasingly being used by the United Nations Development Programme (UNDP) in its Human Development Reports. It is related to the Human Development Index (HDI) in that it measures *deprivations* in the three basic dimensions of human development that is captured in the HDI. These dimensions are: first, a long and healthy life and its corresponding deprivation used in the HPI is the vulnerability to death at a relatively early age, as measured by the probability at birth of not surviving to the age of 40. Second, knowledge – and the deprivation derived from this HDI dimension is the exclusion from the world of reading and communications, as measured by the adult illiteracy rate. Third, a decent standard of living – and the derivation used in the HPI is a lack of access to overall economic provisioning, as measured by the unweighted average of two indicators, the percentage of the population without sustainable access to an improved water source and the percentage of children under weight for age (UNDP, 2005).

The HPI is calculated as follows:

$$HPI = \left[ \frac{1}{3} (P_1^\alpha + P_2^\alpha + P_3^\alpha) \right]^{\frac{1}{\alpha}} \dots\dots\dots (5)$$

where:  $P_1$  = the Probability at birth of not surviving to age 40 (times 100)  
 $P_2$  = Adult illiteracy rate  
 $P_3$  = Unweighted average of population without sustainable access to an improved water source and children under weight for age.  
 $\alpha = 3$

### 5.2 Measuring Vulnerability

While there is a consensus on the measures of poverty, most vulnerability measures are just been developed and some of them have not been widely adopted. It is also important to know that different disciplines measure vulnerability in different ways. This section presents important measures of vulnerability from the economics discipline, and the environmental science discipline.

#### 5.2.1 Measuring Vulnerability: The Economics Approach

In the economics discipline vulnerability to poverty is measured as the probability that a household (or an individual), whether currently poor or not, would find itself poor in the future.

Usually, the concept of vulnerability is understood in the income space to express the probability that a household will become *consumption* poor in the future. In this case, vulnerability is measured with respect to the consumption poverty line.

Mathematically, vulnerability,  $V_{ht}$ , is measured as:

$$V_{ht} = pr(c_{h,t+1} \leq l) \dots\dots\dots (6)$$

where  $c_{h,t+1}$  is the household's per-capita consumption level at time  $t+1$ .

Following from the definition of vulnerability in equation 6, the determinants of the household consumption ( $c_h$ ) are used because a household's consumption pattern in any period is influenced by cross-sectional determinants of consumption as well as inter-temporal aspects of consumption. Consumption can therefore be presented in the following reduced form expression:

$$c_{ht} = c(X_h, \beta_t, \alpha_h, \varepsilon_{ht}) \dots\dots\dots (7)$$

where:  $X_h$  denotes a bundle of observable household characteristics

$\beta_t$  is a vector of parameters describing the state of the economy at time  $t$

$\alpha_h$  and  $\varepsilon_{ht}$  represent, respectively, an unobservable time-invariant household-level effect, and any idiosyncratic factors that contribute to differential welfare outcomes for households that are otherwise observationally equivalent.

Substituting equation 7 into equation 6, the expression for the vulnerability can be rewritten as:

$$V_{ht} = Pr(c_{h,t+1} = c(X_h, \beta_{t+1}, \alpha_h, \varepsilon_{h,t+1}) \leq l | X_h, \beta_t, \alpha_h, \varepsilon_{ht}) \dots\dots\dots (8)$$

The expression in equation 8 suggests that a household's vulnerability level derives from the stochastic properties of the inter-temporal consumption stream it faces, and these in turn depend on a number of household characteristics and the characteristics of the environment it operates (Chaudhuri, 2001).

Thus, the different types of shocks that households are faced with are incorporated in the measure of vulnerability to poverty. Covariant shocks such as droughts, floods, earthquakes, price rises, worsened terms-of –trade for agricultural products, and other health-related shocks that affect whole communities are represented in equation 8 as  $\alpha_h$ . Household-specific shocks such as job losses, death in the household, death of the breadwinner, indebtedness, illnesses, injury, and birth in the family are entered into the system as  $\varepsilon_{ht}$ . These shocks determine how a household is currently vulnerable to future consumption poverty, as denoted by the subscripts in equation 8.

### 5.2.2 Measuring Vulnerability: The Environmental and Development Approach

Different organizations working on environmental sustainability have developed different measures of vulnerability in order to advance their course. Among them include the Commonwealth Vulnerability Index, developed in 2000.

#### **5.2.2.1 The Commonwealth Vulnerability Index (CVI)**

The CVI was developed based on three years of intensive research carried out with the mandate of the Commonwealth finance ministers and endorsed by the heads of government. The index was based on two principles: first, the impact of external shocks over which the country affected has little or no control; and second the resilience of a country to withstand and recover from such shocks. In this framework, therefore, vulnerability means exposure to exogenous shocks over which the affected country has little or no control, and relatively low resilience to withstand and recover from such shocks.

The CVI is a country-level index, which ranks developing countries according to measurable components of exposure and resilience to external shocks. The construction of the index is based on the observation that income growth volatility is the most apparent manifestation of vulnerability (Commonwealth Secretariat, 2000). The three sources of this volatility that are used in the index are the lack of diversification (as measured by the United Nations Conference on Trade and Development's diversification Index); The extent of export dependence (as indicated by the share of exports in GDP); and the impact of natural disasters (as represented by the portion of the population affected, reflecting the cumulative frequency and impact of these events over a period of 27 years).

Finally, these sources of vulnerability are combined to form a composite index of the impact of the impact of vulnerability on developing countries. The resulting index is then weighted by average GDP as a proxy for resilience.

#### **5.2.2.2 The Environmental Vulnerability Index**

The Environmental Vulnerability Index (EVI) has just been developed by the South Pacific Applied Geoscience Commission (SOCAP) and the United Nations Environmental Programme. It was developed through consultations with governments, institutions and leading experts throughout the world. According to UNEP and SOPAC (2005) the EVI has been developed to provide a rapid and standardised method for characterising vulnerability in an overall sense, and identifying issues that may need to be addressed within each of the three pillars of sustainability, namely environmental, economic and social aspects of a country's development. The main aim for the creation of the EVI is to promote sustainable development across the world and cooperation on issues relating to the world's natural life-support ecosystems.

The EVI is based on 50 indicators for estimating the vulnerability of the environment of a country to future shocks. These include indicators on weather and climate (6 indicators), geology (4 indicators), geography (6 indicators), ecosystem resources and services (28 indicators) and ecological processes and human interactions (6 indicators).

### **5.2.2.3 Prevalent Vulnerability Index**

The Prevalent Vulnerability Index (PVI) was developed by the Inter-American Development Bank. The PVI estimates vulnerability in terms of exposure in the prone areas, socioeconomic fragility and lack of social resilience.

## **6. VULNERABILITY AND VULNERABLE GROUPS**

Vulnerability hinges on the notion that certain groups in society are more susceptible to shocks that threaten their livelihoods and survival. It is mostly the members of these vulnerable groups that are at a high risk of perpetuating poverty to the next generation. Vulnerable groups have a low resilience to a given shock because of a limited portfolio of assets at their disposal. They are an important aspect in the analysis of vulnerability and poverty because of their inability to take advantage of profitable opportunities. As such, without substantial support they usually end up in severe and persistent poverty. Groups that are more prone to poverty due to their high vulnerability differ significantly between the developing and the developed countries.

In developing countries there are large sections of society that may be classified as vulnerable. In many developing countries in general, and in sub-Saharan Africa, in particular, HIV/AIDS infected and affected households are accounting for a significant proportion of vulnerable groups. According to UNAIDS (2004), the HIV/AIDS prevalence rate in the sub-Saharan Africa is 7.4 %. Such HIV/AIDS affected households are more susceptible to becoming poor in the presence of a shock – whether it is an economic shock, such as rising prices, or a natural disaster such as a flood. The situation is exacerbated because they usually have no means to cope with the shock when it occurs. Another vulnerable group that is increasingly becoming more common in the developing countries is orphans, mainly due to the HIV/AIDS pandemic. In certain areas, the death of parents due to the HIV/AIDS pandemic means that the household becomes child-headed. In such households, their resilience to a given shock is usually very low because they hardly hold any assets, and are therefore least protected from it.

Female-headed households also represent another important vulnerable group in developing countries, particularly in Africa. These households have a low asset base, such that their resilience in the face of a shock is very low. This makes them very vulnerable to the effects of such shocks because they have low coping strategies. It is in this respect that measures to reduce their vulnerability to the impact of shocks, thereby improving their susceptibility to poverty need to empower such groups to make them more resilient.

The third group includes children, particularly the girl child. In most of the developing world, special programmes are put in place to ensure that children are not malnourished; that they



have access to education and health care facilities to ensure that they lead a healthy life and are less prone to serious poverty. However, these programmes may not be well spread throughout a particular country, such that some children would still remain vulnerable. In Africa, the girl child is particularly vulnerable because she is subjected to carrying out household chores, some of which are beyond her capacity. This gives her less time to concentrate on her studies, and it increases the likelihood of her dropping from school.

In developed countries, on the other hand, there are fewer groups of people in society that are vulnerable. However, the elderly need special attention to ensure that they are not vulnerable to poverty. It is in this regard that in many societies, there are social security systems in place to ensure that the elderly, who form a significant proportion of the population in the developed countries, are not vulnerable to poverty.

The disabled represent another vulnerable group both in developing and developed countries. Usually, the disabled cannot manage to fend for themselves and they need special attention to ensure that they do not fall or remain in poverty. The third category includes the minority groups and immigrants. If there are no deliberate policies to integrate them into the wider society of the developed countries, the minorities and the immigrants may be more vulnerable to poverty, and may course a great challenge to the government, as is the current case in France.

## **7. CASE STUDIES**

This section presents case studies from Malawi in southern Africa, Tajikstan in central Asia and France and other countries in Europe to ascertain the importance of considering vulnerability in any social, economic and environmental analysis, and to outline the practical linkages between vulnerability and poverty.

### **7.1 The Impact of Drought in Malawi.**

Malawi, like many countries in southern Africa continues to experience severe and persistent droughts. In the past ten years, Malawi has been hit by severe drought for about four years. These persistent droughts, combined with the devastating impact of HIV/AIDS continue to threaten the livelihoods of thousands of men, women and children, who depend on agriculture for their livelihoods. It is estimated that due to the drought in the 2004-2005 crop production season, more than five million people (out of a total population of about 11 million) are currently depending on food aid. The 2004/5 drought reduced the food staple harvest to only 37% of the total food requirement.

The impact of the recurrent droughts is of great concern in Malawi because the economy is heavily dependent on rain-fed agriculture. Almost 85% of the population in Malawi are employed in the agricultural sector, most of whom are subsistence farmers. As such the occurrence of a drought makes the majority of these households who derive their livelihoods from farming vulnerable to poverty. The situation is worsened by the fact that the majority of these farmers are so poor that they have no assets at their disposal. Some of the few households who hold assets (in the form of livestock and bicycles) sell their assets to supplement their consumption in the face of the drought.

The catastrophic consequences of droughts in Malawi are more prevalent in households that are affected by HIV/AIDS. For these households, the experience of multiple shocks make them more vulnerable to poverty. The situation is worsened by their lack of coping strategies when these shocks occur. These households' main coping strategy is to depend on food aid from the Government, non-governmental organizations and international humanitarian organizations.

Although drought is the single greatest natural hazard in Malawi, leading more households into poverty, Malawi does not yet have effective drought preparedness and mitigation strategies. Despite having a body of water in Lake Malawi, the country does not have any significant irrigation networks. As such when a drought occurs the majority of the population, most of whom live below the poverty line, are pushed further into poverty.

## **7.2 Labor Migration as a result of Poverty in Tajikistan.**

The economy of Tajikistan is still trying to recover after the collapse of the Soviet Union and the end of the civil conflict, which together created severe poverty problems. The Government of the Republic of Tajikistan has developed a Poverty Reduction Strategy paper, which is the major strategy of pulling the republic out of poverty. The principal objective of the poverty reduction strategy is to increase real incomes in the country, achieve a fair distribution of the benefits of growth and, in particular, ensure a rise in living standards of the poorest groups of the population (PRSP 2002).

Before independence, per capita income in the country was one of the lowest among the Soviet republics and the percentage of population living in poverty one of the highest. This was to a large extent the result of an economic policy that did not take into account the comparative advantages of the country and its regions.

Poverty in Tajikistan is a multidimensional phenomenon. As various surveys show, poverty as determined by the level of income and consumption is widespread. This is mainly due to limited income earning opportunities and to the low level of salaries, especially in agriculture, as well as restricted access to manufacturing assets and limited access to such key public services as education, healthcare and water supply.

The most vulnerable groups in society are children, the elderly and the sick or invalids. The risk of being a poor sharply increases depending on the number of children below 15 years in the household. However, the most vulnerable to poverty and subsequent labor migration, is rural population. The majority population of Tajikistan, 72 %, is residing in rural areas where the poverty incidence is particularly evident.

Tajikistan economy is restricted to cotton, production of aluminium and trade. This limited economic opportunities and Tajikistan's mountainous terrain make it difficult for its inhabitants to make a living. As the result of the limited economic opportunities Tajikistan was considered one of the poor Central Asian Republics and labour migration has been an opportunity to escape poverty. With one in every four households having members regularly travelling abroad to generate an income, allowing them to sustain their families at home. The citizens of Tajikistan seasonally migrate to neighbouring Commonwealth of Independent States (CIS), although the majority migrate to Russia, and the Government of Tajikistan has encouraged Tajik commercial banks to operate transfers of remittances efficiently and at low costs. It is estimated that in 2004 more than 286 million US dollars were remitted through these banks, and Tajik labour migrants are increasingly using official banking channels to send back their earnings in order to avoid leakage of their earnings during their return (IOM Newsletter 2004). However, the remittances are increasing annually. With several hundred thousand Tajik migrants currently abroad, and an increasing trust in the reliability of the money transfer system, an inflow of capital is surging into rural areas. The remittances are the only source of income in many families.

A recent survey conducted by International Organization for Migration (IOM 2004) shows that this money is usually spent on subsistence and/ or saved for traditional ceremonies. As the capacity to invest these resources in productive sectors is limited, support in entrepreneurship would allow vulnerable migrant households to optimize the use of their remittances and contribute to developing the rural economy. Indeed, it would be at best ineffective, at worst dangerous, to leave the issue of labor migration aside of the overall framework of development in Tajikistan. With roughly 30% of the rural male population being abroad, the risks but also the possibilities of labor migration as a transitional agent of change should not be underestimated: the labor migrants' success in providing for his/her family can act as a safety net for preventing other vulnerable community members to reverting to illegal and destabilizing activities.

Most economists share the opinion that well managed migration flows and their derived financial resources are one of the most promising avenues for development and reducing the poverty in Tajikistan.

### 7.3 Heat Wave 2003 in Europe



Picture 1: A thermometer in Alicante shows an unprecedented temperature of 64°C which represents a new dimension even for southern Spain. (Source: *Munich Re 2004: 26*).

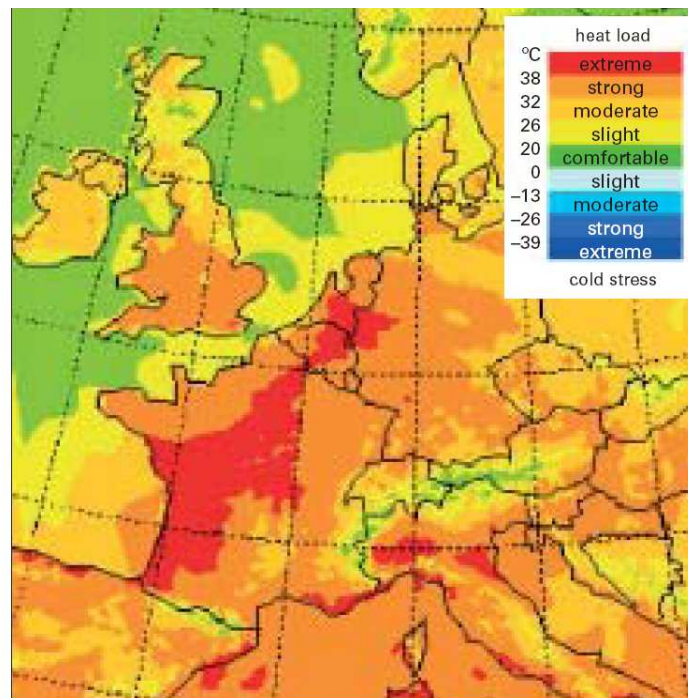
The summer (June to August) 2003 was the warmest summer ever recorded on the northern hemisphere, with temperatures being 3.4 °C above the 1961-1990 average in Germany (STARDEX). Temperatures in August exceeded nearly all heat records throughout Europe. This unprecedented event had severe economic and human consequences: it caused economic losses of 13 billion US\$, most of them in agriculture and as a cause of forest fires. Other negative effects were a restriction in inland shipping due to low water, production bottlenecks in industry and power plants because of heated river water, which caused problems in cooling, and a reduction in worker efficiency, which is certainly difficult to measure (Munich Re 2004: 23).

As the most severe effect, the heat wave caused between 22,000 and 35,000 excess fatalities all over Europe, most of them in France, as it can be seen in table 1.

	Fatalities
France	14,800
Spain	2,000
Portugal	1,300
Italy	4,000
Germany	3,500
United Kingdom	900
Netherlands	500

**Table 1: Victims of the hot summer in Europe 2003. Source: Munich Re 2004: 25.**

The high number of deaths in France was partly due to a higher perceived temperature, which was triggered by the higher humidity in that region. Figure 3 shows a map of the perceived temperature for Europe on August 8, 2003.



**Figure 3: Perceived temperatures in Europe on August 8, 2003**  
**Source: Munich Re 2004: 25.**

Studies for France revealed that particularly older people were affected by the unusual temperatures: “excess mortality in France was estimated at 20% for those aged 45-74 years, at 70% for the 75-94 year age group, and at 120% for people over 94 years” (Pirard et al. 2005). Excess mortality was also higher for women than for men (Pirard et al. 2005; WHO 2004). Infants and children in contrast were not particularly affected. A similar affect on the mortality of older people was also detected for other European countries, e.g. for England/Wales (Johnson et al. 2004) and for Switzerland (Grize et al. 2005).

People living in large cities also bore a higher risk of being affected by the temperatures: “In summer 2003 death rates in Paris were 130 per cent higher than in summer 2002, compared to a 20 per cent rise in rural regions (Milligan 2005). Finally one study found a reciprocal relation between the number of excess deaths and the socioeconomic status of the affected people in Italian cities, although there are doubts concerning the results, because many wealthier people could afford to leave the city during the time of the heat wave (Kosatsky 2005).

Interestingly there were clear differences in fatalities between French regions or cities, with Marseille and Nice being the most evident example: while the death excess was 53% in Nice, it was “only” 26% in Marseille. Apart from the fact that the number of older people is slightly

higher in Nice, Marseille had already experienced a heat wave in 1983. Thus the city was prepared in a way that it had risk management plans for hospitals and a public communication strategy (Kosatsky 2005).

According to some studies (e.g. Meehl and Tebaldi 2004) weather situations like the one in the summer 2003 are likely to occur much more often in the future due to anthropogenic climate change. Furthermore there are projections saying that the number of older persons (60 years or older) will globally triple to almost two billion by 2050 (Milligan 2005). Therefore measures have to be developed to help particularly older people in coping with the effects of such extreme events. Needless to say that this is only one example, and similar measures have to be developed for other vulnerable groups and different hazards as well.

## **8. CONCLUSIONS**

The paper discussed the different aspects of vulnerability and how it relates to poverty. The concept of vulnerability is a relatively new concept and different opinions exist on how to define and measure it. However, there is a growing consensus in the scientific literature and in the development cooperation field that the most important forms of vulnerability are vulnerability to natural disasters, vulnerability to climate change, and vulnerability to economic shocks. In the developing countries, vulnerability to climate change, economic shocks and natural disasters most often make households vulnerable to poverty. This is the case because poor people are generally more vulnerable to all kinds of hazards because of their low resilience and poor coping mechanisms, coupled with the lack of insurance against these shocks.

The concept of vulnerability is increasingly becoming more important because a significant proportion of the world population is poor, and with increasing population growth, rapid urbanisation, environmental degradation and the frequency and magnitude of natural disasters, vulnerability is no longer a concept that can be ignored. The international community now emphasizes on the need for a comprehensive approach to address vulnerability. Such an approach needs to take into account the social, economic, and cultural dimensions of vulnerability in order to fully address the catastrophic consequences of these hazards and how they move poor households deeper into poverty or how they push people below the poverty line.

The comprehensive approach that is being advanced by the development cooperation community and leading scientists has resulted in the analysis of vulnerability from different perspectives, leading to a variety of ways to measure it. While most of these measures of vulnerability incorporate exposure to natural disasters, effects of weather and climate, among others, a measure of vulnerability to poverty is a money-metric one. The vulnerability to poverty measure is mainly concerned with economic shocks, and it treats the occurrence of

natural hazards as shocks that reduce a household's welfare. The measure then quantifies this loss (usually expressed as resulting into consumption loss) and then relates how that loss leads a household into poverty, or moves poor households further into poverty.

The paper pointed out that vulnerability and poverty are not the same, because vulnerability is not only restricted to poor people and because of its forward-looking nature. Nevertheless they are closely related and efforts to reduce poverty always have to take into account the different aspects of vulnerability, if they are aiming for a sustainable poverty reduction.

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